NBS CIRCULAR 552

Standard Samples and Reference Standards Issued by the National Bureau of Standards

UNITED STATES DEPARTMENT OF COMMERCE

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National Bureau of Standards Circular 552
Issued August 31, 1954
Supersedes Circular 398 and its Supplements

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.
Price 25 cents

CONTENTS

Standard Samples and Reference Standards Issued by the National Bureau of Standards

This Circular contains a descriptive listing of the various Standard Samples issued by the National Bureau of Standards. A schedule of weights and fees, as well as directions for ordering, is included. Summarized tables of analyses are presented, to indicate the type of standards of composition presently available. Announcements of new standards will be made in scientific and trade journals, and the current status of the various standards will be indicated by a mimeographed insert.

1. Introductory Information on the Uses of Standard Samples

The National Bureau of Standards' Standard Samples are materials that have been carefully analyzed or the physical properties of which have been precisely determined at the Bureau and sometimes in other laboratories. Today, more than 500 different Standard Samples of metals, ores, ceramics, chemicals, and reference standards are available for distribution to analytical and research laboratories. About 200 of these materials are certified for chemical composition. Some 75 of the composition standards have been prepared specifically for use in spectrographic analysis. Other standard materials include those certified for such properties as acidity (pH), viscosity, melting-point, density, index of refraction, heat of combustion, color, and gloss. Recent additions include a number of radioactive materials and isotopes for use in nuclear physics, biochemical research, and allied fields.

Some of the principal uses of NBS standard chemical and physical standards are: checking methods of analysis and analytical techniques; standardizing volumetric solutions; investigating improved methods of analyses; establishing the accuracy of new analytical methods; and calibrating and standardizing spectrometers, spectrographs, colorimeters, pH meters, Geiger counters, scintillators, ionization chambers, pyrometers, polarimeters, refractometers, viscometers, and other laboratory and plant instruments.

Standard hydrocarbons, certified for degree of purity, serve to calibrate instruments used in controlling the production of plastics, synthetic rubber, and motor fuels. Standard-fineness cements facilitate the standardizing of fine-mesh sieves and surface-area measurements. Standard rubber-compounding materials contribute to the precision and accuracy of control testing in the rubber industry.

Among the reference standards, gloss and color standards are used to control the finish of paints, paper, and other materials where color and reflectance are critical. Thermal-radiation standards in the form of electric incandescent lamps are used to calibrate thermopiles. Light-sensitive paper samples find use in standardizing fading lamps for determining the light-fastness of textiles, paints, and other materials.

2. Purchase Procedure

2.1. Identification of Samples

The samples are listed by groups; the sample numbers represent the order of issuance of the first representative of each kind. Renewals of an analyzed sample are indicated by the original number, with an added letter to denote its intended relation. Thus, 10a is the first, 10b the second, and 10c the third renewal of No. 10 Bessemer 0.4 C steel. In this way a given number will always represent a material of fixed or approximately fixed composition. Numbers missing from the series in the following table represent samples of which the supply has become exhausted and which it is not the present intention to replace.

2.2. Ordering

Orders should give both the *number and name* of the sample wanted. Example: No. 10f, steel, Bessemer, 0.4 C. The list of standard samples, their numbers, prices, and analyses are to be found in the succeeding pages. No samples of smaller size than those listed are distributed.

For oils and hydrocarbons, see special order procedure indicated on page 12.

2.3. Terms and Shipping

(a) Domestic Shipments

Shipments of material (other than hydrocarbons, organic sulfur compounds and radioactive standards) intended for the United States, its possessions, Mexico, Canada, and Cuba are normally shipped prepaid parcel post unless the purchaser requests a different mode of shipment, in which case the shipment will be sent collect. Hydrocarbons, organic sulfur compounds and radioactive standards are shipped express collect. (See pages 12 and 13.)

(b) Foreign Shipments

Small shipments will be forwarded as a United States Government shipment via International Parcel Post (providing that the parcel does not exceed the weight limits as prescribed by Postal Laws and Regulations to foreign countries). Shipments exceeding the parcel post weight limit must be handled through an agent (shipping or brokerage firm) located in the United States as designated by the purchaser. Parcels will be packed for overseas shipment and forwarded via express collect to the United States firm designated as agent.

(c) Payment for Foreign Orders

Remittances in payment of foreign orders must be made payable to the Treasurer of the United States, and are required in advance. These remittances must be drawn on a bank in the United States and payable at the standard rate of United States currency.

3. Standard Samples, With Schedule of Weights and Fees

3.1. Descriptive List

[For detailed information on compositions and properties certified, see p. 15 to 23, as indicated in the table of contents, p. ii. *(See mimeographed insert for standards out of stock, renewals, and new standards.)*]

Standards of Chemical Composition

Sample No.	Name	Approximate weight of sample in grams	Price per sample	Sample No.	Name	Approximate weight of sample in grams	Price per sample
	STEELS (CHEMICAL STANDARDS)						
8h	Bessemer, 0.1 C	150	$3. 75	72e	Cr-Mo (SAE X4130)	150	3. 75
10f	Bessemer, 0.4 C	150	3. 75	111b	Ni-Mo (SAE 4620)	150	3. 75
170	B. O. H., 0.03 C, 0.2 Ti	150	4. 00	36a	Cr2-Mo1	150	3. 75
15e	B. O. H., 0.1 C	150	3. 75	106a	Cr-Mo-Al (Nitralloy G)	150	3. 75
11g	B. O. H., 0.2 C	150	3. 75	135	Cr5-Mo0.5	150	3. 75
12f	B. O. H., 0.4 C	150	3. 75	139	Cr-Ni-Mo (NE 8637)	150	3. 75
152	B. O. H., 0.5 C, 0.04 Sn	150	3. 75	156	Cr-Ni-Mo (NE 9450)	150	3. 75
13e	B. O. H., 0.6 C	150	3. 75	159	Cr1-Mo0.4-Ag0.1	150	3. 75
14d	B. O. H., 0.8 C	150	3. 75				
16d	B. O. H., 1.0 C	150	3. 75	50b	W18-Cr4-V1	150	4. 50
				132a	Mo5-W6-Cr4-V1.5	150	4. 50
19f	A. O. H., 0.2 C	150	3. 75	134	Mo9-W2-Cr4-V1	150	4. 50
20f	A. O. H., 0.4 C	150	3. 75	153	Mo8-W1.5-Cr4-V2-Co8	150	4. 50
21d	A. O. H., 0.6 C, 0.08 Sn	150	3. 75	155	Cr0.5-W0.5	150	4. 50
34a	A. O. H., 0.8 C	150	3. 75	167	Co43-Mo4-Nb3-W4 (S-816)	150	5. 00
51a	Electric furnace, 1.2 C	150	3. 75	73b	Stainless (Cr14)	150	4. 50
65c	Basic electric, 0.3 C	150	3. 75	133a	Stainless (Cr13-Mo0.3-S0.3)	150	4. 50
100a	Manganese (SAE T1345)	150	3. 75	101d	Cr18-Ni9 (SAE 30905)	150	4. 50
105	High-sulfur, 0.2 C (carbon only)	150	2. 00				
125	High-silicon, 5.0 Si	150	3. 75	121b	Cr18-Ni10 (Ti-bearing)	150	4. 50
129a	High-sulfur (SAE X1112)	150	3. 75	123a	Cr18-Ni11 (Nb-bearing)	150	4. 50
130	Lead-bearing, 0.2 Pb	150	3. 75	123b	Cr-Ni-Nb 0.7-Ta 0.2	150	4. 50
151	Boron-bearing, 0.003 B	150	3. 00	160a	Cr19-Ni9-Mo3	150	4. 50
				166	Cr19-Ni9 (carbon only)	100	3. 00
30c	Cr-V (SAE 6150)	150	3. 75				
32d	Cr-Ni (SAE 3140)	150	3. 75	126a	High-nickel (Ni36)	150	4. 50
33d	Ni-Mo (SAE 4820)	150	3. 75	161	Casting alloy (Ni64-Cr17-Fe15)	150	4. 50
	IRONS						
4h	Cast iron	150	$4. 50	82a	Nickel-chromium cast iron	150	$4. 50
5j	Cast iron	150	4. 50	107a	Nickel-molybdenum cast iron	150	4. 50
6f	Cast iron	150	4. 50	115	Nickel-chromium-copper cast iron	150	4. 50
7e	Cast iron	150	4. 50				
				122c	Cast iron (car wheel)	150	4. 50
55d	Ingot iron	150	4. 50				

Descriptive List—Continued

Standards of Chemical Composition—Continued

Sample No.	Name	Approximate weight of sample in grams	Price per sample	Sample No.	Name	Approximate weight of sample in grams	Price per sample
	STEEL-MAKING ALLOYS						
57	Refined silicon	60	$4.00	66a	Spiegeleisen	100	$4.00
58	Ferrosilicon (75% Si)	75	4.00	68b	Ferromanganese	100	4.00
59	Ferrosilicon (50% Si)	75	4.00	71	Calcium molybdate	60	4.00
61a	Ferrovanadium (high carbon)	100	4.00	90	Ferrophosphorus	75	4.00
64a	Ferrochromium (high carbon)	100	4.00	116a	Ferrotitanium (low carbon)	100	4.00
	NONFERROUS ALLOYS						
85a	Aluminum alloy, wrought	65	$4.00	127a	Solder (Pb70–Sn30)	200	$5.00
86c	Aluminum-base casting alloy	65	4.00				
87	Aluminum-silicon alloy	65	4.00	157	Nickel silver (Cu72–Ni18–Zn10)	125	5.00
				161	Nickel-base casting alloy	150	4.50
37d	Brass, sheet	150	5.00	162	Monel type (Ni66–Cu29)	150	5.00
164	Brass, aluminum	150	5.00	169	Ni77–Cr20 alloy	150	4.50
52c	Bronze, cast	150	5.00	167	Heat-resisting alloy S–816 Co43–Mo4–Nb3–W4.	150	5.00
62c	Bronze, manganese	150	5.00				
63c	Bronze, phosphorus	150	5.00				
124c	Bronze (Cu85–Pb5–Sn5–Zn5)	150	5.00	171	Magnesium-base alloy	100	4.00
158	Bronze, silicon	150	5.00	94b	Zinc-base die-casting alloy	150	4.50
53c	Lead-base bearing metal	200	5.00				
54d	Tin-base bearing metal	200	5.00				
	ORES						
25c	Manganese ore	100	$3.25	56b	Phosphate rock (Tennessee)	45	$3.25
27c	Iron ore, Mesabi	125	3.25	113	*Zinc ore (Tri-State concentrate)*	50	3.25
28a	Iron ore, Norrie	50	2.00	137	Tin ore (Bolivian concentrate)	50	3.25
				138	Tin ore (N. E. I. concentrate)	50	3.25
69a	Bauxite	60	3.25				
	CERAMIC MATERIALS						
76	Burned refractory (40% Al_2O_3)	60	$3.25	93	Glass, high boron	45	$3.25
77	Burned refractory (60% Al_2O_3)	60	3.25	81	Glass sand	60	3.25
78	Burned refractory (70% Al_2O_3)	60	3.25	165	Glass sand (low iron)	60	3.25
79	Fluorspar	60	3.25	1a	Limestone, argillaceous	50	3.25
97	Clay, flint	60	3.25	88	Limestone, dolomitic	50	3.25
98	Clay, plastic	60	3.25				
99	Feldspar, soda	40	3.25	102	Silica brick	60	3.25
				103	Chrome refractory	60	3.25
80	Glass, soda-lime	45	3.25	104	Burned magnesite	60	3.25
89	Glass, lead-barium	45	3.25	112	Silicon carbide	85	3.25
91	Glass, opal	45	3.25				
92	Glass, low boron	45	3.25	154	Titanium dioxide	40	3.25

Descriptive List—Continued

Standards of Chemical Composition—Continued

MICROCHEMICAL STANDARDS

Sample No.	Name	Constituents determined or intended use	Approximate weight of sample in grams	Price per sample
140	Benzoic acid	C, H	2	$3. 50
141	Acetanilide	N, C, H	2	3. 50
142	Anisic acid	Methoxyl	2	3. 50
143	Cystine	S, C, H, N	2	3. 50
145	2-iodobenzoic acid	I	2	3. 50
	Chemicals			
84d	Acid potassium phthalate	Acidimetric value	60	$3. 25
39g	Benzoic acid	Acidimetric and calorimetric values	30	3. 25
40f	Sodium oxalate	Oxidimetric value	60	3. 25
83b	Arsenic trioxide	Oxidimetric value	75	3. 25
136a	Potassium dichromate	Oxidimetric value	75	3. 25
17	Sucrose (cane-sugar)	Saccharimetric value	60	3. 25
41	Dextrose (glucose)	Reducing value	70	3. 25
	pH Standards			
185a	Acid potassium phthalate	pH (approx.) 4.0	60	$2. 50
186Ib	Potassium dihydrogen phosphate	pH (approx.) 6.8 [1]	[2] 60	5. 00
186IIb	Disodium hydrogen phosphate			
187a	Borax	pH (approx.) 9.2	30	2. 50
188	Potassium hydrogen tartrate	pH (approx.) 3.6	60	2. 50
189	Potassium tetroxalate	pH (approx.) 1.7	65	2. 50
	Melting-Point Standards			
44d	Aluminum	659.7° C	200	$3. 00
45c	Copper	1083.3° C	450	3. 00
49d	Lead	327.40° C	600	3. 00
42e	Tin	231.91° C	350	3. 00
43f	Zinc	419.50° C	350	3. 00
	Turbidimetric and Fineness Standards			
47i	Cement	No. 200 sieve residue, 9.4%	160	$2. 50
114h	Cement	No. 325 sieve residue, 11.1% Surface area, 1680 cm²/g Air permeability, 2950 cm²/g	20	2. 50

[1] 2 phosphates are to be used together in equal molar proportions.
[2] 30 g of each phosphate are furnished.

Descriptive List—Continued

Spectrographic Standards

Sample Nos. [1]		Name	Price [2] per sample	Sample Nos. [1]		Name	Price [2] per sample
Steels—(Spectrographic Standards)							
401	801	B. O. H., 0.4 C	$5.00	416a	816a	Nitralloy G	$5.00
402	802	B. O. H., 0.8 C	5.00	417	817	A. O. H., 0.4 C	5.00
403a	803a	A. O. H., 0.6 C	5.00	417a	817a	B. O. H., 0.4 C	5.00
404a	804a	Basic electric	5.00	418	818	Cr-Mo (SAE X4120)	5.00
405a	805a	Medium manganese	5.00	419	[3]	Ni-Mo (SAE 4620)	5.00
				420a	820a	Ingot iron	5.00
406	[3]	Chromium-vanadium	5.00				
407a	807a	Chromium-vanadium	5.00	421	821	Cr-W, 0.9 C	5.00
408	808	Chromium-nickel	5.00				
409a	[3]	Nickel	5.00	425	825	Mn-Ni-Cr(NE 9450) (boron only)	5.00
409b	809b	Nickel	5.00	426	826	Cr-Mo (SAE 4150) (boron only)	5.00
410a	810a	2 Cr-1 Mo	5.00	427	827	Cr-Mo (SAE 4150) (boron only)	5.00
				428	828	Mn-Cr (boron only)	5.00
411a	811a	Cr-Mo (SAE X4130)	5.00	429	829	Ni-Cr-B (boron only)	5.00
412a	812a	Cr-Ni-Mo (NE 8637)	5.00	430	830	Ni-Cr-B (boron only)	5.00
413	813	A. O. H., 0.4 C	5.00				
414	[3]	Cr-Mo (SAE 4140)	5.00	442	[3]	Stainless (16Cr–10Ni)	8.00
415a	815a	Bessemer, 0.5 C	5.00	443	[3]	Stainless (18Cr–9Ni)	8.00
				444	[3]	Stainless (21Cr–10Ni)	8.00

[1] Sizes are 400 series, rods 7/32 in. in diameter, 4 in. long (20 g); 800 series rods ½ in. in diameter, 2 in. long (50 g).

[2] For each sample in the 400 and 800 series.

[3] This standard is available in only one size.

Sample No.	Name	Approximate weight of sample in grams	Price per sample	Sample No.	Name	Approximate weight of sample in grams	Price per sample
ALUMINUM ALLOYS [1]—(SPECTROGRAPHIC STANDARDS)							
601	Aluminum alloy, wrought (14S)	160	$8.00	604	Aluminum-base casting alloy (142).	160	$8.00
602	Aluminum alloy, wrought (24S)	160	8.00				
603	Aluminum alloy, wrought (61S)	160	8.00				

[1] Aluminum standards are disks 2½ in. in diameter, ¾ in. thick.

TIN METAL (SPECTROGRAPHIC STANDARDS)							
431 [1]	Tin A	25	$8.00	831 [1]	Tin A	45	$14.00
432	Tin B	25	8.00	832	Tin B	45	14.00
433	Tin C	25	8.00	833	Tin C	45	14.00
434	Tin D	25	8.00	834	Tin D	45	14.00
435	Tin E	25	8.00	835	Tin E	45	14.00

[1] Sizes are: 400 series, rods ¼ in. in diameter, 4 in. long; 800 series, rods, ½ in. in diameter, 2 in. long.

Descriptive List—Continued

Paint-Pigment Standards for Color and Tinting Strength Only

Sample No.	Name	Approximate weight of sample in grams	Price per sample	Sample No.	Name	Approximate weight of sample in grams	Price per sample
300	Toluidine red toner	40	$3.00	314	Yellow iron oxide, light lemon	20	$3.00
301	Yellow ocher	45	3.00	315	Yellow iron oxide, lemon	20	3.00
302	Raw sienna	45	3.00	316	Yellow iron oxide, orange	25	3.00
303	Burnt sienna	50	3.00	317	Yellow iron oxide, dark orange	40	3.00
304	Raw umber	45	3.00	318	Lampblack	15	3.00
305	Burnt umber	50	3.00	319	Primrose chrome yellow	65	3.00
306	Venetian red	60	3.00	320	Lemon chrome yellow	60	3.00
				321	Medium chrome yellow	65	3.00
307	Metallic brown	60	3.00				
308	Indian red	50	3.00	322	Light chrome orange	100	3.00
309	Mineral red	65	3.00	323	Dark chrome orange	100	3.00
310	Bright red oxide	50	3.00	324	Ultramarine blue	37	3.00
311	Carbon black (high color)	10	3.00	325	Iron blue	25	3.00
312	Carbon black (all-purpose)	20	3.00	326	Light chrome green	60	3.00
313	Black iron oxide	42	3.00	327	Medium chrome green	50	3.00
				328	Dark chrome green	45	3.00

Standards for Rubber Compounding [1]

370a	Zinc oxide	2,000	$1.65	375b	Channel black	7,500	$3.50
371a	Sulfur	1,000	.60	376	Light magnesia	140	.85
372a	Stearic acid	600	1.20	377	Phenyl-beta-naphthylamine	600	4.00
373b	Benzothiazyl-disulfide	500	1.20	378	Oil furnace black	7,000	3.50
374a	Tetramethylthiuram-disulfide	500	2.25	379	Conducting black	5,500	3.50

[1] Normally, samples are shipped railway express, express charges collect.

Hydrocarbons and Organic Sulfur Compounds

Sample No.[1]	Compound		Amount of impurity [2]	Volume per sample [3]	Price per sample
	Formula	Name			
		PARAFFINS			
			mole percent	*ml*	
201a–5	C_5H_{12}	*n*-Pentane	0.15±0.07	5	$10
201a–8S	C_5H_{12}	*n*-Pentane	.15±0.07	8	18
201a–25	C_5H_{12}	*n*-Pentane	.15±0.07	25	35
202a–8S	C_5H_{12}	2-Methylbutane (isopentane)	.09±0.06	8	18
299–5S	C_5H_{12}	2,2-Dimethylpropane(neopentane)	.04±0.02	5	25
203b–5	C_6H_{14}	*n*-Hexane	.020±0.010	5	10
203a–8S	C_6H_{14}	*n*-Hexane	.10±0.05	8	18
203b–25	C_6H_{14}	*n*-Hexane	.020±0.010	25	35
204a–8S	C_6H_{14}	2-Methylpentane	.16±0.08	8	18
205a–8S	C_6H_{14}	3-Methylpentane	[4].20±0.15	8	18
206a–8S	C_6H_{14}	2,2-Dimethylbutane	.10±0.04	8	18
207a–8S	C_6H_{14}	2,3-Dimethylbutane	.11±0.06	8	18
216a–5	C_7H_{16}	*n*-Heptane	.01±0.01	5	10
216a–8S	C_7H_{16}	*n*-Heptane	.01±0.01	8	18
216a–25	C_7H_{16}	*n*-Heptane	.01±0.01	25	35
223–5S	C_7H_{16}	2-Methylhexane	.23±0.07	5	18
224–5S	C_7H_{16}	3-Methylhexane	[4].25±0.15	5	18
225–5S	C_7H_{16}	3-Ethylpentane	.13±0.03	5	18
226–5S	C_7H_{16}	2,2-Diemethylpentane	.21±0.06	5	18
227–5S	C_7H_{16}	2,3-Dimethylpentane	[4].25±0.15	5	18
228–5S	C_7H_{16}	2,4-Dimethylpentane	.17±0.05	5	18
229–5S	C_7H_{16}	3,3-Dimethylpentane	.20±0.15	5	18
222–5S	C_7H_{16}	2,2,3-Trimethylbutane	.06±0.03	5	18

See footnotes at end of tables.

Descriptive List—Continued

Hydrocarbons and Organic Sulfur Compounds—Continued

Sample No.[1]	Compound		Amount of impurity [2]	Volume per sample [3]	Price per sample
	Formula	Name			
		PARAFFINS—Continued			
			Mole percent	*ml*	
230–5S	C_8H_{18}	*n*-Octane	0.06 ± 0.04	5	$25
231–5S	C_8H_{18}	2-Methylheptane	.41 ± 0.18	5	25
232–5S	C_8H_{18}	3-Methylheptane	.50 ± 0.23	5	25
233–5S	C_8H_{18}	4-Methylheptane	.12 ± 0.07	5	25
234–5S	C_8H_{18}	3-Ethylhexane	[4] .30 ± 0.20	5	25
235–5S	C_8H_{18}	2,2-Dimethylhexane	.29 ± 0.11	5	25
236–5S	C_8H_{18}	2,3-Dimethylhexane	[4] .30 ± 0.20	5	25
237–5S	C_8H_{18}	2,4-Dimethylhexane	[4] .30 ± 0.20	5	25
238–5S	C_8H_{18}	2,5-Dimethylhexane	.30 ± 0.09	5	25
239–5S	C_8H_{18}	3,3-Dimethylhexane	[4] .30 ± 0.20	5	25
240–5S	C_8H_{18}	3,4-Dimethylhexane	[4] .30 ± 0.20	5	25
241–5S	C_8H_{18}	2-Methyl-3-ethylpentane	.23 ± 0.11	5	25
242–5S	C_8H_{18}	3-Methyl-3-ethylpentane	.08 ± 0.04	5	25
243–5S	C_8H_{18}	2,2,3-Trimethylpentane	.42 ± 0.20	5	25
217a–5	C_8H_{18}	2,2,4-Trimethylpentane [5,6]	.04 ± 0.03	5	10
217–8S	C_8H_{18}	2,2,4-Trimethylpentane [5,6]	.12 ± 0.05	8	18
217a–25	C_8H_{18}	2,2,4-Trimethylpentane [5,6]	.04 ± 0.03	25	35
217–50	C_8H_{18}	2,2,4-Trimethylpentane [5,6]	.12 ± 0.05	50	60
244–5S	C_8H_{18}	2,3,3-Trimethylpentane	.40 ± 0.08	5	25
245–5S	C_8H_{18}	2,3,4-Trimethylpentane	.19 ± 0.06.	5	25
252–5S	C_9H_{20}	*n*-Nonane	.08 ± 0.06	5	35
541–5S	C_9H_{20}	2,2,3-Trimethylhexane	[4] .30 ± 0.20	5	35
253–5S	C_9H_{20}	2,2,4-Trimethylhexane	.30 ± 0.20	5	35
254–5S	C_9H_{20}	2,2,5-Trimethylhexane	.20 ± 0.04	5	35
542–5S	C_9H_{20}	2,3,3-Trimethylhexane	.13 ± 0.06	5	35
255–5S	C_9H_{20}	2,3,5-Trimethylhexane	[4] .30 ± 0.20	5	35
256–5S	C_9H_{20}	2,4,4-Trimethylhexane	.29 ± 0.11	5	35
544–5S	C_9H_{20}	3,3,4-Trimethylhexane	.23 ± 0.10	5	35
289–5S	C_9H_{20}	3,3-Diethylpentane	.018 ± 0.011	5	35
296–5S	C_9H_{20}	2,2,3,3-Tetramethylpentane	.064 ± 0.020	5	35
297–5S	C_9H_{20}	2,2,3,4-Tetramethylpentane	.035 ± 0.014	5	35
257–5S	C_9H_{20}	2,2,4,4-Tetramethylpentane	.16 ± 0.08	5	35
298–5S	C_9H_{20}	2,3,3,4-Tetramethylpentane	.051 ± 0.037	5	35
505–5S	$C_{10}H_{22}$	*n*-Decane	.04 ± 0.02	5	35
562–5S	$C_{11}H_{24}$	*n*-Undecane	.04 ± 0.03	5	35
559–5S	$C_{12}H_{26}$	*n*-Dodecane	.031 ± 0.025	5	35
554–5S	$C_{12}H_{26}$	2,2,4,6,6-Pentamethylheptane	.06 ± 0.04	5	35
573–5S	$C_{13}H_{28}$	*n*-Tridecane	.09 ± 0.06	5	35
580–5S	$C_{14}H_{30}$	*n*-Tetradecane	.07 ± 0.06	5	35
581–5S	$C_{15}H_{32}$	*n*-Pentadecane	.07 ± 0.05.	5	35
568–5S	$C_{16}H_{34}$	*n*-Hexadecane	.06 ± 0.04	5	35

See footnotes at end of tables.

Descriptive List—Continued

Hydrocarbons and Organic Sulfur Compounds—Continued

Sample No.[1]	Compound		Amount of impurity [2]	Volume per sample [3]	Price per sample
	Formula	Name			
		ALKYL CYCLOPENTANES			
			Mole percent	*ml*	
219–5S	C_5H_{10}	Cyclopentane	0.05 ± 0.02	5	$18
208a–5	C_6H_{12}	Methylcyclopentane	.11 ± 0.06	5	10
208a–8S	C_6H_{12}	Methylcyclopentane	.11 ± 0.06	8	18
208a–25	C_6H_{12}	Methylcyclopentane	.11 ± 0.06	25	35
266–5S	C_7H_{14}	Ethylcyclopentane	.06 ± 0.03	5	25
267–5S	C_7H_{14}	1,1-Dimethylcyclopentane	.03 ± 0.02	5	35
268–5S	C_7H_{14}	1,*cis*-2-Dimethylcyclopentane	.031 ± 0.016	5	35
269–5S	C_7H_{14}	1,*trans*-2-Dimethylcyclopentane	.19 ± 0.10	5	35
270–5S	C_7H_{14}	1,*cis*-3-Dimethylcyclopentane	.65 ± 0.23	5	35
271–5S	C_7H_{14}	1,*trans*-3-Dimethylcyclopentane	.39 ± 0.09	5	35
272–5S	C_8H_{16}	*n*-Propycyclopentane	.20 ± 0.10	5	25
273–5S	C_8H_{16}	Isopropylcyclopentane	.20 ± 0.07	5	25
274–5S	C_8H_{16}	1-Methyl-1-ethylcyclopentane	.13 ± 0.08	5	50
275–5S	C_8H_{16}	1-Methyl-*cis*-2-ethylcyclopentane	.48 ± 0.24	5	50
279–5S	C_8H_{16}	1,1,2-Trimethylcyclopentane	.015 ± 0.009	5	50
280–5S	C_8H_{16}	1,1,3-Trimethylcyclopentane	.48 ± 0.32	5	50
290–5S	C_8H_{16}	1,*cis*-2,*cis*-3-Trimethylcyclopentane	.10 ± 0.06	5	50
292a–5S	C_8H_{16}	1,*trans*-2,*cis*-3-Trimethylcyclopentane	.14 ± 0.04	5	50
294–5S	C_8H_{16}	1,*cis*-2,*trans*-4-Trimethylcyclopentane	.42 ± 0.23	5	50
295–5S	C_8H_{16}	1,*trans*-2,*cis*-4-Trimethylcyclopentane	.24 ± 0.10	5	50
517–5S	C_9H_{18}	*n*-Butylcyclopentane	.034 ± 0.025	5	35
518–5S	C_9H_{18}	Isobutycyclopentane	.16 ± 0.08	5	35
583–5S	$C_{10}H_{18}$	Cyclopentylcyclopentane	.05 ± 0.03	5	35
588–5S	$C_{15}H_{30}$	*n*-Decylcyclopentane	.20 ± 0.18	5	35
		ALKYL CYCLOHEXANES			
209a–5	C_6H_{12}	Cyclohexane	0.010 ± 0.006	5	$10
209a–8S	C_6H_{12}	Cyclohexane	.010 ± 0.006	8	18
209a–25	C_6H_{12}	Cyclohexane	.010 ± 0.006	25	35
218a–5	C_7H_{14}	Methylcyclohexane [5]	.03 ± 0.02	5	10
218a–8S	C_7H_{14}	Methylcyclohexane [5]	.03 ± 0.02	8	18
218–25	C_7H_{14}	Methylcyclohexane [5]	.10 ± 0.05	25	35
258–5S	C_8H_{16}	Ethylcyclohexane	.13 ± 0.08	5	25
259–5S	C_8H_{16}	1,1-Dimethylcyclohexane	.19 ± 0.03	5	35
260–5S	C_8H_{16}	1,*cis*-2-Dimethylcyclohexane	.024 ± 0.015	5	35
261–5S	C_8H_{16}	1,*trans*-2-Dimethylcyclohexane	.08 ± 0.07	5	35
263–5S	C_8H_{16}	1,*cis*-3-Dimethylcyclohexane [7]	.09 ± 0.05	5	35
262–5S	C_8H_{16}	1,*trans*-3-Dimethylcyclohexane [8]	.16 ± 0.07	5	35
264–5S	C_8H_{16}	1,*cis*-4-Dimethylcyclohexane	.06 ± 0.04	5	35
265–5S	C_8H_{16}	1,*trans*-4-Dimethylcyclohexane	.14 ± 0.08	5	35
506–5S	C_9H_{18}	*n*-Propylcyclohexane	.08 ± 0.05	5	25
507–5S	C_9H_{18}	Isopropylcyclohexane	.16 ± 0.07	5	25
516–5S	C_9H_{18}	1,1,3-Trimethylcyclohexane	.21 ± 0.05	5	50
508–5S	$C_{10}H_{20}$	*n*-Butylcyclohexane	.08 ± 0.04	5	35
509–5S	$C_{10}H_{20}$	Isobutylcyclohexane	.17 ± 0.09	5	35
510–5S	$C_{10}H_{20}$	*sec*-Butylcyclohexane	[4] .30 ± 0.20	5	35
511–5S	$C_{10}H_{20}$	*tert*-Butylcyclohexane	.05 ± 0.03	5	35
591–5S	$C_{16}H_{32}$	*n*-Decylcyclohexane	.14 ± 0.11	5	35

See footnotes at end of tables.

Descriptive List—Continued

Hydrocarbons and Organic Sulfur Compounds—Continued

Sample No.[1]	Compound: Formula	Compound: Name	Amount of Impurity [2]	Volume per sample [2]	Price per sample
		MONOOLEFINS			
			Mole percent	*ml*	
281–5S	C_5H_{10}	1-Pentene	0.66 ± 0.40	5	$25
282b–5S	C_5H_{10}	*cis*-2-Pentene	.30 ± 0.10	5	25
283–5S	C_5H_{10}	*trans*-2-Pentene	.09 ± 0.05	5	25
284–5S	C_5H_{10}	2-Methyl-1-butene	.14 ± 0.08	5	25
285–5S	C_5H_{10}	3-Methyl-1-butene	.24 ± 0.12	5	25
286–5S	C_5H_{10}	2-Methyl-2-butene	.06 ± 0.04	5	25
519–5S	C_6H_{12}	1-Hexene	.14 ± 0.08	5	35
526–5S	C_6H_{12}	*cis*-2-Hexene	.30 ± 0.10	5	35
527–5S	C_6H_{12}	*trans*-2-Hexene	.17 ± 0.11	5	35
528–5S	C_6H_{12}	*cis*-3-Hexene	.13 ± 0.08	5	35
529–5S	C_6H_{12}	*trans*-3-Hexene	.06 ± 0.03	5	35
530–5S	C_6H_{12}	2-Methyl-1-pentene	.19 ± 0.09	5	35
531–5S	C_6H_{12}	3-Methyl-1-pentene	.30 ± 0.20	5	35
532–5S	C_6H_{12}	4-Methyl-1-pentene	.18 ± 0.12	5	35
533–5S	C_6H_{12}	2-Methyl-2-pentene	.09 ± 0.05	5	35
534–5S	C_6H_{12}	3-Methyl-*cis*-2-pentene	.15 ± 0.08	5	35
535–5S	C_6H_{12}	3-Methyl-*trans*-2-pentene	.14 ± 0.09	5	35
537–5S	C_6H_{12}	4-Methyl-*cis*-2-pentene	.08 ± 0.07	5	35
536–5S	C_6H_{12}	4-Methyl-*trans*-2-pentene	.25 ± 0.07	5	35
538–5S	C_6H_{12}	2-Ethyl-1-butene	.10 ± 0.04	5	35
539–5S	C_6H_{12}	2,3-Dimethyl-1-butene	.14 ± 0.13	5	35
287–5S	C_6H_{12}	3,3-Dimethyl-1-butene	.09 ± 0.06	5	35
540–5S	C_6H_{12}	2,3-Dimethyl-2-butene	.10 ± 0.05	5	35
520–5S	C_7H_{14}	1-Heptene	.20 ± 0.10	5	35
589–5S	C_7H_{14}	4-Methyl-1-hexene	.22 ± 0.16	5	35
547–5S	C_7H_{14}	4,4-Dimethyl-1-pentene	.15 ± 0.08	5	35
582–5S	C_7H_{14}	4,4-Dimethyl-*cis*-2-pentene	.21 ± 0.11	5	35
574–5S	C_7H_{14}	4,4-Dimethyl-*trans*-2-pentene	.09 ± 0.03	5	35
550–5S	C_7H_{14}	2,3,3-Trimethyl-1-butene	.06 ± 0.04	5	35
521–5S	C_8H_{16}	1-Octene	.24 ± 0.13	5	35
548–5S	C_8H_{16}	*trans*-4-Octene	.16 ± 0.11	5	35
545–5S	C_8H_{16}	2,4,4-Trimethyl-1-pentene	.09 ± 0.03	5	35
546–5S	C_8H_{16}	2,4,4-Trimethyl-2-pentene	.08 ± 0.05	5	35
551–5S	C_9H_{18}	1-Nonene	.24 ± 0.18	5	35
552–5S	$C_{10}H_{20}$	1-Decene	.11 ± 0.07	5	35
555–5S	$C_{11}H_{22}$	1-Undecene	.09 ± 0.08	5	35
584–5S	$C_{12}H_{24}$	1-Dodecene	.13 ± 0.07	5	35
590–5S	$C_{16}H_{32}$	1-Hexadecene	.16 ± 0.07	5	35
		DIOLEFINS			
512–5S	C_4H_6	1,2-Butadiene	0.08 ± 0.05	5	$25
513–5S	C_4H_6	1,3-Butadiene	[3] .08 ± 0.04	5	25
569–5S	C_5H_8	1,2-Pentadiene	[3] .34 ± 0.15	5	35
563–5S	C_5H_8	1-*cis*-3-Pentadiene	[3] .08 ± 0.04	5	35
564–5S	C_5H_8	1-*trans*-3-Pentadiene	[3] .08 ± 0.04	5	35
565–5S	C_5H_8	1,4-Pentadiene	[3] .07 ± 0.05	5	35
558–5S	C_5H_8	2,3-Pentadiene	[3] .15 ± 0.07	5	35
549–5S	C_5H_8	2-Methyl-1, 3-butadiene (isoprene)	[3] .04 ± 0.03	5	35
553–5S	C_6H_{10}	1,5-Hexadiene	[3] .11 ± 0.08	5	35
570–5S	C_6H_{10}	2,3-Dimethyl-1, 3-butadiene	[3] .06 ± 0.04	5	35

See footnotes at end of tables.

Descriptive List—Continued

Hydrocarbons and Organic Sulfur Compounds—Continued

Sample No.[1]	Compound: Formula	Compound: Name	Amount of impurity [2]	Volume per sample [2]	Price per sample
		CYCLOMONOOLEFINS			
			Mole percent	*ml*	
288–5S	C_5H_8	Cyclopentene	0.034 ± 0.021	5	$25
522–5S	C_6H_{10}	Cyclohexene	.023 ± 0.020	5	35
557–5S	C_8H_{12}	4-Ethenyl-1-cyclohexene (4-vinyl-1-cyclohexene)	[9] .10 ± 0.07	5	35
		ACETYLENES			
514–5S	C_4H_6	1-Butyne	0.13 ± 0.07	5	$25
515–5S	C_4H_6	2-Butyne	.069 ± 0.038	5	25
		ALKYL BENZENES			
210b–5	C_6H_6	Benzene	0.023 ± 0.015	5	$10
210a–8S	C_6H_6	Benzene	.03 ± 0.02	8	18
210a–25	C_6H_6	Benzene	.03 ± 0.02	25	35
211a–5	C_7H_8	Methylbenzene (toluene)[5]	.04 ± 0.02	5	10
211a–8S	C_7H_8	Methylbenzene (toluene)[5]	.04 ± 0.02	8	18
211a–25	C_7H_8	Methylbenzene (toluene)[5]	.04 ± 0.02	25	35
211a–50	C_7H_8	Methylbenzene (toluene)[5]	.04 ± 0.02	50	60
212a–5	C_8H_{10}	Ethylbenzene	.04 ± 0.02	5	10
212a–8S	C_8H_{10}	Ethylbenzene	.04 ± 0.02	8	18
212a–25	C_8H_{10}	Ethylbenzene	.04 ± 0.02	25	35
213a–5	C_8H_{10}	1,2-Dimethylbenzene (*o*-xylene)	.010 ± 0.007	5	10
213a–8S	C_8H_{10}	1,2-Dimethylbenzene (*o*-xylene)	.010 ± 0.007	8	18
213a–25	C_8H_{10}	1,2-Dimethylbenzene (*o*-xylene)	.010 ± 0.007	25	35
214a–5	C_8H_{10}	1,3-Dimethylbenzene (*m*-xylene)	.06 ± 0.04	5	10
214b–8S	C_8H_{10}	1,3-Dimethylbenzene (*m*-xylene)	.07 ± 0.03	8	18
214a–25	C_8H_{10}	1,3-Dimethylbenzene (*m*-xylene)	.06 ± 0.04	25	35
215c–5	C_8H_{10}	1,4-Dimethylbenzene (*p*-xylene)	.05 ± 0.03	5	10
215b–8S	C_8H_{10}	1,4-Dimethylbenzene (*p*-xylene)	.06 ± 0.03	8	18
215b–25	C_8H_{10}	1,4-Dimethylbenzene (*p*-xylene)	.06 ± 0.03	25	35
221–5S	C_9H_{12}	*n*-Propylbenzene	.25 ± 0.08	5	25
220–5	C_9H_{12}	Isopropylbenzene	.07 ± 0.03	5	10
220a–8S	C_9H_{12}	Isopropylbenzene	.05 ± 0.03	8	18
220–25	C_9H_{12}	Isopropylbenzene	.07 ± 0.03	25	35
246–5S	C_9H_{12}	1-Methyl-2-ethylbenzene	.27 ± 0.07	5	35
247–5S	C_9H_{12}	1-Methyl-3-ethylbenzene	.43 ± 0.15	5	35
248–5S	C_9H_{12}	1-Methyl-4-ethylbenzene	.13 ± 0.03	5	35
249–5S	C_9H_{12}	1,2,3-Trimethylbenzene	.018 ± 0.012	5	35
250–5S	C_9H_{12}	1,2,4-Trimethylbenzene	.33 ± 0.20	5	35
251–5S	C_9H_{12}	1,3,5-Trimethylbenzene	.05 ± 0.02	5	35
501–5S	$C_{10}H_{14}$	*n*-Butylbenzene	.12 ± 0.08	5	35
502–5S	$C_{10}H_{14}$	Isobutylbenzene	.13 ± 0.09	5	35
503–5S	$C_{10}H_{14}$	*sec*-Butylbenzene	.12 ± 0.06	5	35
504–5S	$C_{10}H_{14}$	*tert*-Butylbenzene	.06 ± 0.03	5	35
560–5S	$C_{10}H_{14}$	1-Methyl-3-isopropylbenzene	.064 ± 0.038	5	35
571–5S	$C_{10}H_{14}$	1-Methyl-4-isopropylbenzene	.05 ± 0.03	5	35
523–5S	$C_{10}H_{14}$	1,2-Diethylbenzene	.05 ± 0.03	5	35
524–5S	$C_{10}H_{14}$	1,3-Diethylbenzene	.07 ± 0.04	5	35
525–5S	$C_{10}H_{14}$	1,4-Diethylbenzene	.07 ± 0.02	5	35
566–5S	$C_{10}H_{14}$	1,3-Dimethyl-5-ethylbenzene	.11 ± 0.06	5	35
575–5S	$C_{10}H_{14}$	1,2,3,5-Tetramethylbenzene	.08 ± 0.02	5	35
585–5S	$C_{10}H_{14}$	1,2,4,5-Tetramethylbenzene	.14 ± 0.04	5	35
572–5S	$C_{11}H_{16}$	1-Methyl-3-*tert*-butylbenzene	.08 ± 0.05	5	35
576–5S	$C_{11}H_{16}$	1-Methyl-4-*tert*-butylbenzene	.05 ± 0.03	5	35
586–5S	$C_{16}H_{26}$	*n*-Decylbenzene	.20 ± 0.16	5	35

See footnotes at end of tables.

Descriptive List—Continued

Hydrocarbons and Organic Sulfur Compounds—Continued

Sample No.[1]	Compound: Formula	Compound: Name	Amount of impurity [2]	Volume per sample [3]	Price per sample
		NAPHTHALENES			
			Mole percent	*ml*	
577–5S	$C_{10}H_8$	Naphthalene	0.04 ± 0.03	5	$35
587–5S	$C_{10}H_{12}$	1,2,3,4-Tetrahydronaphthalene	.14 ± 0.06	5	35
578–5S	$C_{11}H_{14}$	1-Methylnaphthalene	.08 ± 0.03	5	35
579–5S	$C_{11}H_{14}$	2-Methylnaphthalene	.09 ± 0.06	5	35
		POLYCYCLIC AROMATIC HYDROCARBONS			
556–5S	C_9H_{10}	2,3-Dihydroindene (Indan)	0.06 ± 0.02	5	$35
567–5S	$C_{10}H_{18}$	*cis*-Decahydronaphthalene (*cis*-Bicyclo [4.4.0] decane)	.11 ± 0.05	5	35
561–5S	$C_{10}H_{18}$	*trans*-Decahydronaphthalene (*trans*-Bicyclo [4.4.0] decane)	.04 ± 0.03	5	35
		ORGANIC SULFUR COMPOUNDS [10]			
904–5S	C_2H_6S	Ethanethiol (ethyl mercaptan)	0.05 ± 0.04	5	$35
907–5S	$C_2H_6S_2$	Methyldithiomethane (dimethyl disulfide) [11]	.03 ± 0.02	5	35
902–5S	C_3H_8S	Methylthioethane (methyl ethyl sulfide) [11]	.04 ± 0.04	5	35
901–5S	C_4H_4S	Thiophene	.013 ± 0.011	5	35
903–5S	$C_4H_{10}S$	Ethylthioethane (diethyl sulfide) [11]	.06 ± 0.04	5	35
905–5S	$C_4H_{10}S$	2-Methyl-2-propanethiol (*tert*-butyl mercaptan)	.08 ± 0.04	5	35
908–5S	$C_4H_{10}S_2$	Ethyldithiodisulfide (diethyl disulfide) [11]	.10 ± 0.08	5	35
906–5S	$C_5H_{10}S$	1-Pentanethiol (*n*-pentyl mercaptan)	.08 ± 0.05	5	35

[1] The designations following the sample numbers indicate the following: "–5S" or "–8S", a sample of 5 ml or 8 ml sealed "in vacuum" in a special Pyrex-glass ampoule with internal "break-off" tip: "–5", "–25", or "–50", a sample of 5, 25, or 50 ml sealed "in vacuum" in a plain-glass ampoule. Although, with a few exceptions, each of the samples originally distributed by the NBS and the API was from a single preparation, this will not continue to be true when the original preparations are exhausted and replacements are made. Such new preparations will be indicated by differences in the sample number. For example, in this list isopropylbenzene 220–5 and 220–25 are from one preparation and 220a–8S is from another.

[2] Unless otherwise indicated, the purity has been evaluated from measurements of freezing points. See J. Research NBS **35**, 355 (1945) RP1676.

[3] Tolerance approximately ±10 percent. All volumes have been estimated in the liquid state, including those of compounds normally solid.

[4] Estimated by analogy with isomers subjected to similar purification.

[5] Certified with regard to density and refractive index.

[6] Certified with regard to calorimetric heat of combustion.

[7] This isomer, formerly known as *"trans"*, see Science **105**, 647 (1947), has the following properties: Boiling point at one atmosphere, 120.09° C; refractive index, n_D at 25° C, 1.4206; density at 25° C, 0.7620 g/ml. See NBS Circular 461, p. 45 (1947).

[8] This isomer, formerly known as *"cis"*, see Science **105**, 647 (1947), has the following properties: Boiling point at one atmosphere, 124.45° C; refractive index, n_D at 25° C, 1.4284; density at 25° C, 0.7806 g/ml. See NBS Circular 461, p. 45 (1947).

[9] When sealed. Polymer formed may be removed as residue by simple vaporization of the sample "in vacuum" at an appropriate temperature.

[10] In the determination of the purity of these compounds an apparatus providing no connection with the atmosphere was employed. See Anal. Chem. **22**, 1521 (1950).

[11] These compounds are here named in accordance with the recommendations of the International Union of Pure and Applied Chemistry. The samples themselves bear labels in accordance with recommendations made for the naming of sulfur compounds in petroleum. See Chem. and Eng. News **24**, 2765 (1946). The samples are labeled as follows: 907–5S, 2,3-dithiabutane; 902–5S, 2-thiabutane; 903–5S, 3-thiapentane; and 908–5S, 3,4-dithiahexane.

SAMPLES CERTIFIED FOR DENSITY AND REFRACTIVE INDEX

The following three compounds of the original NBS list are certified with respect to values of density, for air-saturated material at 1 atm, at 20°, 25°, and 30° C, to ±0.00002 g/ml, and also with respect to values of refractive index, for each of seven wavelengths (helium 668 and 502, hydrogen 656 (C) and 486 (F), mercury 546 (e) and 436 (g), and sodium 589 (D_1, D_2) at 20°, 25°, and 30° C. to ±0.00002):

No. 217a..... 2,2,4-Trimethylpentane.
No. 218a..... Methylcyclohexane.
No. 211a..... Toluene.

These standards may be used to calibrate refractometers, picnometers, and density balances, as well as spectrometers. A certificate is supplied with each of these samples.

SAMPLES CERTIFIED FOR CALORIMETRIC HEAT OF COMBUSTION

Standard Sample 217a, 2,2,4-Trimethylpentane, is also certified with regard to the value for calorimetric heat of combustion, primarily for calibrating apparatus for determining the heating value of gasoline and other liquid fuels.

INSTRUCTIONS AND CONNECTING TUBES

A set of instructions for transferring standard samples of hydrocarbons "in vacuum" may be obtained on request.

The unsaturated hydrocarbons are usually sealed in ampoules of Pyrex Red glass. In order to facilitate the handling of these ampoules, each laboratory obtaining one or more samples in such ampoules will be supplied gratis one special graded glass connecting tube of appropriate diameter, consisting of Pyrex Red to Pyrex Uranium to Pyrex Clear glass.

Descriptive List—Continued

ORDERS

The standard samples of hydrocarbons listed herein were prepared through a cooperative undertaking between the American Petroleum Institute and the National Bureau of Standards. The preparation of the organic sulfur compounds involved, in addition, the cooperation of the U. S. Bureau of Mines at Laramie, Wyo. By agreement with the American Petroleum Institute, distribution of these two groups of standard samples by the National Bureau of Standards is limited to laboratories not directly associated with the petroleum industry. Orders from such laboratories should be sent to the National Bureau of Standards, Washington 25, D. C. Orders from laboratories that are associated with the petroleum industry should be sent, in duplicate, with payment in advance, to the American Petroleum Institute, Carnegie Institute of Technology, Pittsburgh, Pa.

In all cases, compounds should be specified by both name and sample number.

SHIPMENTS

All orders for hydrocarbons or organic sulfur compounds are shipped express collect.

Oils for Use as Viscometer Calibrating Liquids

These oils are not intended for use as permanent viscosity standards. They are not suitable for stockroom items and should be ordered only for immediate use. More than a 1-pint sample of any given oil is not supplied unless it is established that this quantity is inadequate. All available liquids are hydrocarbon oils and are listed in the following tables.

A. For use with viscometers calibrated in units of absolute or kinematic viscosity. Price covers the sample and a report containing accurate values at time of shipment, for absolute viscosity, kinematic viscosity, and density at the following temperatures:

APPROXIMATE VISCOSITIES [1]

Oil	Absolute, in poises at—						Kinematic, in stokes at—						Price [2] per sample f. o. b. Washington, D. C.
	20° C	25° C	30° C	37.78° C (100° F)	40° C	50° C	20° C	25° C	30° C	37.78° C (100° F)	40° C	50° C	
D	0.020	0.018	------	0.014	------	------	0.026	0.023	------	0.019	------	------	$10
H	.074	.063	------	.044	------	------	.091	.078	------	.055	------	------	10
I	.12	.10	------	.066	------	------	.14	.12	------	.081	------	------	10
J	.21	.17	------	.11	------	------	.25	.21	------	.13	------	------	10
K	.41	.32	------	.18	------	------	.48	.38	------	.22	------	------	10
L	1.0	.74	------	.37	------	------	1.1	.84	------	.43	------	------	10
M	3.0	2.1	------	1.0	------	------	3.4	2.4	------	1.1	------	------	10
N	14	9.6	------	4.0	------	------	16	11	------	4.6	------	------	10
OB	330	210	------	--------	62	------	380	240	------	--------	70	------	25
P	--------	--------	480	--------	200	95	--------	--------	540	--------	230	110	25

[1] Viscosity values can be supplied, as a special service, for other temperatures in the range 20° to 100° C, except that values for oil P can be supplied only for temperatures in the range 30° to 100° C. An extra charge is made for these special services. For oils D through N, the charge is $10 per sample per temperature in addition to the charge of $10 per sample listed in the table. For oils OB and P, the charge is $16 per sample per temperature in addition to the charge of $25 per sample listed in the table.

[2] Normally, samples are shipped via railway express, express charges collect. Requests for shipment by other methods usually will be disregarded.

B. For use with Saybolt viscometers. Price covers the sample and a report containing an accurate value at the time of shipment, for the viscosity at the indicated temperature.

APPROXIMATE VISCOSITY [1]

Oil	Temperature, ° F	Viscosity	Price [2] per sample, f. o. b. Washington, D. C.
SB	100	300 seconds, Saybolt Universal	$5
SC	130	300 seconds, Saybolt Universal	5
SF	122	170 seconds, Saybolt Furol	5

[1] Viscosity values at other temperatures or in other units are not supplied.

[2] Normally, samples are shipped via railway express, express charges collect. Requests for shipment by other methods usually will be disregarded.

Descriptive List—Continued

Radioactive Standards*

ALPHA, BETA, GAMMA STANDARDS

Sample No.	Radiation	Nuclide	Nominal Activity [a]	Volume	Price per sample
4900	α (β)	RaD+E+F [b]	200 dps	(Electrodeposited source)	$15.00
4901	α (β)	RaD+E+F [b]	500 dps	(Electrodeposited source)	15.00
4902	α (β)	RaD+E+F [b]	1000 dps	(Electrodeposited source)	15.00
4903	α	U_3O_8 [c]	15 dps	(Evaporated source)	15.00
4910	β (α)	RaD+E [d]	200 dps	Electrodeposited source	10.00
4911	β (α)	RaD+E [d]	500 dps	Electrodeposited source	10.00
4912	β (α)	RaD+E [d]	1000 dps	Electrodeposited source	10.00
4913	β (γ)	Cobalt-60	10^4 dps/ml [e]	(f)	5.00
4914	γ (β)	Cobalt-60	10^5 dps	5.0 ml	5.00
4915	γ (β)	Cobalt-60	10^6 dps	5.0 ml	5.00
4916	β	Phosphorus-32 [g]	10^5 dps/ml [e]	(f)	5.00
4917	β (γ)	Iodine-131 [g]	10^5 dps/ml [e]	(f)	5.00
4918	β (γ)	Gold-198 [g]	10^5 dps/ml [e]	(f)	10.00
4919	β	Strontium-90 Yttrium-90	10^4 dps/ml [e]	(f)	10.00
4920	β	Thallium-204	10^4 dps/ml [e]	(f)	10.00
4921	β (γ)	Sodium-22	10^4 dps/ml [e]	(f)	10.00
4922	γ (β)	Sodium-22	10^6 dps	5.0 ml	20.00
4923	β (γ)	Sodium-24 [g]	10^5 dps/ml [e]	(f)	10.00
4924	β	Carbon-14	10^3 dps/ml [e]	25.0 ml	10.00
4925	β	Carbon-14 [h]	10^4 dps/g	(crystallized benzoic acid)	5.00
4926	β	Hydrogen-3	10^3 dps/ml	25.0 ml	10.00

*Radioactive standards are shipped express collect.

[a] The exact disintegration rate as of the reference date is given on a certificate accompanying the standard.

[b] Samples consist of RaD+E+F in equilibrium, deposited on a silver disk 1 inch in diameter, 1/16 inch thick and faced with 0.002 inch of palladium. The exact alpha-ray disintegration rate as of the date of calibration is indicated on the certificate accompanying the standard.

[c] Samples consist of U_3O_8 deposited on a 0.1-mm platinum foil and mounted on an aluminum disk, 1¼ inch in diameter and 1/32 inch thick. The exact alpha-ray disintegration rate as of the date of calibration is indicated on the certificate accompanying the standard.

[d] Standards consist of Pb-210—Bi-210 in equilibrium, electrodeposited on the 0.002-inch-thick palladium face of a silver-palladium disk.

[e] Total activity has been adjusted so that AEC authorization is *not* required.

[f] Approximately 3 ml of low-solids carrier solution containing the active nuclide in a flame-sealed ampoule.

[g] Distributed periodically at announced intervals.

[h] For use in liquid scintillation counters.

RADIUM STANDARDS (FOR RADON ANALYSIS)

Sample No.	Radium content	Volume (ml)*	Price per sample
4950	10^{-9} g	100	$3.00
4951	10^{-11} g	100	3.00
4952	Blank solution	100	2.00

* Samples are sealed in glass containers.

RADIUM GAMMA-RAY STANDARDS

Sample No.	Description	Activity	Volume (ml)*	Price per sample
4955	Radium	0.1×10^{-6} g	5	$3.00
4956	Radium	0.2	5	3.00
4957	Radium	0.5	5	3.00
4958	Radium	1.0	5	3.00
4959	Radium	2.0	5	3.00
4960	Radium	5.0	5	3.00
4961	Radium	10	5	3.00
4962	Radium	20	5	3.00
4963	Radium	50	5	4.00
4964	Radium	100	5	5.00

* Samples are contained in flame-sealed glass ampoules.

Descriptive List—Continued

Radioactive Standards—Continued

ROCK AND ORE STANDARDS

Sample No.	Radium rock samples [a]		Price per sample
	Rock	Average radium content (gram of radium per gram of rock)	
4975	Dunite	$(0.009 \pm 0.004) \times 10^{-12}$	$3.00
4976	Carthage limestone	0.15 ± 0.03	3.00
4977	Berea sandstone	0.24 ± 0.02	3.00
4978	Columbia River basalt	0.33 ± 0.03	3.00
4979	Chelmsford granite	2.96 ± 0.08	3.00
4980	Quartzite	0.06 ± 0.01	3.00
4981	Graniteville granite	3.3 ± 0.2	3.00
4982	Gabbro-diorite	0.18 ± 0.02	3.00
4983	Milford granite	0.23 ± 0.02	3.00
4984	Triassic diabase	0.18 ± 0.03	3.00
4985	Deccan trap	0.21 ± 0.04	3.00
4986	Kimberlite	0.59 ± 0.04	3.00

[a] Each sample consists of 100 g of pulverized rock taken from bulk material analyzed for radium content. Petrographic data and approximate chemical analysis of a representative sample of each rock is also given in a certificate accompanying each sample.

THORIUM ORE STANDARDS [a]

Sample No.	Thorium-uranium content (percentage by weight)		Price per sample
	Thorium	Uranium	
	%	%	
4987	1.0	0.04	$6.00
4988	0.1	0.004	6.00
4989	0.05	0.002	6.00
4990	0.02	0.0008	6.00
4991	0.01	0.0004	6.00
4992	0.001	0.00004	6.00

[a] Each sample consists of 100 g of a mixture of monazite and dunite.

URANIUM ORE STANDARDS [a]

Sample No.	Uranium content (percentage by weight)	Price per sample
	%	
4993	1.0	$6.00
4994	0.1	6.00
4995	0.05	6.00
4996	0.02	6.00
4997	0.01	6.00
4998	0.001	6.00

[a] Each sample consists of 100 g of a mixture of pitchblende and dunite.

DUNITE

Sample No.	Description	Price per sample
4999	These are 100-g samples of the dunite used as the bulk carrier for the thorium and uranium ore standards listed above and are intended to be used for the further dilution of the ore samples.	$3.00

Descriptive List—Continued

Light-Sensitive Papers

Sample No.	Item	Unit of issue	Price per set
1015	Light-sensitive paper for calibration of carbon-arc fading lamp for color-fastness tests of textiles. See NBS Letter Circular 1012 for directions for use.	Package of 100 pieces.	$3.00
1016	Booklet of standard faded strips of light-sensitive paper for use with above sample. See NBS Letter Circular 1012 for directions for using the booklet.	Booklet	26.00

Standard Colors for Kitchen and Bathroom Accessories [1]

Sample No.	Item	Unit of issue	Price per set
1000	Enameled iron plaques, 3 by 5 inches, in accordance with Commercial Standards CS62–38 and CS63–38.	Set of 10	$10.00

[1] Calibration of these standards for use with three-filter reflectometers may be obtained by applying to the Bureau.

Limestone Slabs for Calking Compound Tests

Sample No.	Description	Unit of issue	Price per set
1005	Limestone slabs, as required by Federal Specification TT–C–598, "Compound, Calking; Plastic".	Set of 12 slabs	$9.00

Resolution Test Charts

Sample No.	Description [1]	Unit of issue	Price per chart
1010	Resolution chart for testing the resolving power of microcopying cameras	Each In lots of 1,000 or more	$0.20 .15

[1] These charts are made photographically, and consist of a series of line-patterns, the lines and spaces being of equal width. Each pattern contains two sets of lines, one set at right angles to the other. The patterns range from 1 to 10 lines per millimeter. Instructions for the use of these charts are furnished with each order.

Standards of Reference

In addition to the standards already enumerated, this Bureau distributes the following standards of reference that have been compared with master standards at the Bureau or measured for compliance with an arbitrary standard. Detailed information and prices concerning these standards of reference can be obtained by applying to the Bureau.

Standards of thermal radiation (incandescent electric lamps) for calibrating thermopiles. (Fee Schedule 204.201.)

Lamp standards of candlepower or luminous flux. (Fee Schedule 202.101.)

Spectrophotometric standards. (Fee Schedule 202.105.)

Lamp standards of color temperature. (Fee Schedule 202.107.)

Reflectance standards. (Fee Schedule 202.108.)

Glass opacity standards for the paper industry. (Fee Schedule 202.109.)

Gloss standards. (Fee Schedule 202.110.)

The standard listed below, formerly issued by this Bureau, is now issued by the Commodity Standards Division, Office of Industry and Commerce, U. S. Department of Commerce, Washington 25, D. C., and further information and prices may be obtained from that division:

Standard finish samples for builders' hardware.

4. Summary of Analyses

The values given in the following sections are listed primarily as a guide to purchasers. In some cases provisional values are given which may differ slightly from those given on the certificates. For this reason *the certificates issued with the standards should always be consulted to obtain the proper values.*

4.1. Averaged Analyses

ALUMINUM-BASE ALLOYS

Sample No.	Cu	Mn	Si	Mg	Fe	Ti	Zn	Pb	Sn	Ga	Ni	Cr
85a	2.48	0.66	0.114	1.58	0.208	0.016	0.019	0.002	<0.001	0.01	0.41	0.231
86c	7.92	.041	.68	0.002	.90	.035	1.50	.031	-------	-------	.030	.029
87	0.30	.30	6.21	.39	.46	.16	0.077	.068	.063	-------	.59	.17

COPPER-BASE ALLOYS

Sample No.	Kind	Cu	Zn	Sn	Pb	Ni	Fe	Al	Mn
37d	Sheet brass	70.78	26.65	0.97	0.94	0.58	0.076	-------	-------
164	Aluminum brass	63.76	21.89	.63	.22	.046	2.52	6.21	4.68
52c	Cast bronze	89.25	2.12	7.85	.011	.76	0.004	-------	-------
62c	Manganese bronze	59.16	37.25	0.39	.24	.28	.74	1.22	0.66
63c	Phosphor-bronze	-------	-------	-------	-------	-------	-------	-------	-------
158	Silicon bronze	90.86	2.07	.97	.004	.006	1.48	0.54	1.31
157	Nickel silver	72.14	9.69	-------	.023	17.90	0.053	-------	0.020
124c	Ounce metal	84.22	4.93	5.13	4.74	0.60	.107	-------	-------

Sample No.	Kind	Sb	As	Ag	Si	S	P	Co
164	Aluminum brass	-------	-------	-------	0.038	-------	-------	-------
52c	Cast bronze	-------	-------	-------	-------	0.002	0.001	-------
62c	Manganese bronze	-------	-------	-------	.069	-------	-------	-------
63c	Phosphor-bronze	-------	-------	-------	-------	-------	-------	-------
158	Silicon bronze	-------	-------	-------	2.72	-------	-------	-------
157	Nickel silver	-------	-------	-------	-------	-------	-------	0.136
124c	Ounce metal	0.20	-------	-------	0.002	.048	.024	-------

LEAD- AND TIN-BASE ALLOYS

Sample No.	Kind	Pb	Sn	Sb	Bi	Cu	Fe	As	Ag	Ni	Al
53c	Lead-base	-------	5.16	10.20	0.093	0.214	0.0017	0.044	-------	0.0023	-------
127a	Solder	-------	30.03	0.79	.036	.004	-------	.129	0.004	.002	-------
54d	Tin-base	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

MAGNESIUM-BASE ALLOY

Sample No.	Al	Zn	Mn	Si	Cu	Pb	Fe	Ni
171	2.98	1.05	0.45	0.012	0.011	0.0033	0.0018	0.0009

NICKEL-BASE ALLOYS

Sample No.	Kind	Ni	Cu	Mn	Si	Co	Fe	Cr	Al	Ti	C	S	P	Zr	V	Ca	N
162	Monel	66.38	28.93	2.34	0.67	0.54	0.34	0.23	0.23	0.20	0.11	0.003	-----	-----	-----	-----	-----
161	Ni-base casting	64.29	0.045	1.28	1.56	.47	15.01	16.88	-----	-----	.34	.006	0.012	-----	-----	-----	-----
169	Ni-Cr	77.26	.015	0.073	1.42	.19	0.54	20.26	.095	.006	.043	.002	-----	0.042	0.018	0.015	0.031

ZINC-BASE DIE-CASTING ALLOY

Sample No.	Al	Cu	Mg	Fe	Mn	Pb	Ni	Sn	Cd
94b	4.06	1.01	0.042	0.017	0.014	0.006	0.005	0.005	0.002

Averaged Analyses—Continued

STEELS (SPECTROGRAPHIC STANDARDS)

Sample Nos.[1]		Kind	Mn	Si	Cu	Ni	Cr	V	Mo	Al (total)	Sn	Co
401	801	B. O. H., 0.4 C [2]	0. 34	0. 015	0. 015	0. 005	0. 015					
402	802	B. O. H., 0.8 C	. 46	. 060	. 025	. 010	. 025					
403a	803a	A. O. H., 0.6 C	1. 04	. 34	. 096	. 190	. 101	0. 005	0. 033			
404a	804a	Basic electric	0. 88	. 44	. 050	. 040	. 025	. 002	. 007			
405a	805a	Medium manganese	1. 90	. 27	. 032	. 065	. 037		. 005	0. 056		
406	([3])	Chromium-vanadium	0. 71	. 24	. 10	. 080	. 97	. 23	. 005	. 023		
407a	807a	Chromium-vanadium	. 76	. 29	. 132	. 169	. 92	. 146				
408	808	Chromium-nickel	. 62	. 22	. 12	1. 21	. 64					
409a	([3])	Nickel	. 68	. 24	. 11	3. 48	. 025	. 004				
409b	809b	Nickel	. 46	. 27	. 104	3. 29	. 072	. 002	. 009		0. 012	0. 025
410a	810a	2 Cr-1 Mo		. 36	. 11	0. 24	2. 39		. 91			
411a	811a	Cr-Mo (SAE X4130)		. 29	. 105	. 24	0. 93	. 002	. 22			
412a	812a	Cr-Ni-Mo (NE 8637)	. 87	. 30	. 090	. 56	. 55		. 18			
413	813	A. O. H., 0.4 C	. 67	. 22	. 25	. 18	. 055	. 007	. 006			
414	([3])	Cr-Mo (SAE 4140)	. 67	. 26	. 11	. 080	. 99	. 003	. 32	. 020	. 014	
415a	815a	Bessemer, 0.5 C		. 10	. 012	. 006	. 008	. 006		. 11		
416a	816a	Nitralloy G	. 54	. 25	. 15	. 28	1. 14		. 20	1. 08	. 011	
417	817	A. O. H., 0.4 C	. 64	. 18		. 105	0. 028	. 004		0. 013	. 020	
417a	817a	B. O. H., 0.4 C	. 78		. 13	. 062	. 050		. 013		. 036	
418	818	Cr-Mo (SAE X4130)	. 52	. 28		. 11	. 96		. 22			
419	([3])	Ni-Mo (SAE 4620)	. 72	. 27	. 080	1. 71	. 24		. 22		. 009	
420a	820a	Ingot iron	. 017		. 027	0. 0092	. 0032		. 0013	. 003	. 0017	. 006
421	821	Cr-W, 0.9 C	1. 24		. 080	. 10	. 49	. 012	. 040	Tungsten 0. 52		
425	825	Mn-Ni-Cr-(NE 9450)										Boron 0. 0006
426	826	Cr-Mo (SAE 4150)										. 0011
427	827	Cr-Mo (SAE 4150)										. 0027
428	828	Mn-Cr										. 0059
429	829	Ni-Cr-B										. 0091
430	830	Ni-Cr-B										. 019

[1] Sizes are: 400 series, rods 7/32 in. in diameter, 4 in. long; 800 series, rods 1/4 in. in diameter, 2 in. long. [2] The carbon contents of the steel standards lie between 0.1 and 0.9 percent. [3] This standard is available in only one size.

STAINLESS STEEL (SPECTROGRAPHIC STANDARDS)

Sample No.[1]	Kind	Al	B	Co	Cu	Mo	Nb	Pb	Sn	Ti	V	W	Zn	Zr
442	16 Cr-10 Ni [2]	0. 0003	0. 0005		0. 11	0. 12	0. 03	0. 002			0. 032	0. 08	0. 003	
443	18 Cr-9 Ni	. 0006	. 0012		. 14	. 12	. 06	. 003			. 064	. 09	. 005	
444	21 Cr-10 Ni	. 0025	. 0033		. 24	. 22	. 21	. 00[illegible]			. 12	. 18	. 004	

[1] Size: Rods 7/32 in. in diameter, 4 in. long. [2] By difference, the iron content of these standards are: 442, 70.4%; 443, 67.9%; and 444, 62.7%.

ALUMINUM ALLOYS (SPECTROGRAPHIC STANDARDS) [1]

Sample No.	Kind	Cu	Mg	Si	Mn	Fe	Ni	Cr	Ti	Zn
601	Aluminum alloy, wrought (14S)	4. 38	0. 39	0. 88	0. 81	0. 52		0. 020	0. 015	
602	Aluminum alloy, wrought (24S)	4. 44	1. 49	. 130	. 63	. 28		. 007	. 012	
603	Aluminum alloy, wrought (61S)	0. 29	1. 01	. 52		. 21		. 24	. 037	
604	Aluminum-base casting alloy (142)	3. 98	1. 56	. 27		. 45	2. 00		. 100	0. 029

[1] Aluminum standards are disks 2 1/2 in. in diameter, 3/4 in. thick.

TIN METAL (SPECTROGRAPHIC STANDARDS)

Sample Nos.[1]		Cu	Pb	As	Sb	Ni	Zn	Ag	Bi	Cd	Co
431	831	0. 19	0. 19	0. 16	0. 19	0. 038	0. 041	0. 015	0. 020	0. 020	0. 021
432	832	. 097	. 094	. 075	. 095	. 020	. 020	. 0095	. 0098	. 0095	. 011
433	833	. 055	. 055	. 047	. 050	. 0095	. 0095	. 0055	. 0052	. 0053	. 0045
434	834	. 019	. 022	. 019	. 019	. 0044	. 0046	. 0018	. 0020	. 0020	. 0020
435	835	. 0077	. 015	. 0090	. 010	. 0024	. 0020	. 0010	. 0011	. 0011	. 0011

[1] Sizes are 400 series, rods 1/4 in. in diameter, 4 in. long; 800 series, rods 1/2 in. in diameter, 2 in. long.

Averaged Analyses—Continued

IRONS (CHEMICAL STANDARDS)

Sample No.	Kind	C		Mn	P	S		Si	Cu	Ni
		Total	Graphitic			By oxidation	Evolved as H_2S			
4h	Cast	2.44	1.79	0.840	0.124	0.071	0.068	1.34	0.243	0.065
5j	Cast	2.37	1.91	.70	.241	.101	.098	2.44	.99	.018
6f	Cast									
7e	Cast	2.92	2.53	.448	.878	.079	.079	1.88	.022	.011
55d	Ingot	0.011		.030	.004	.013		<0.001	.055	.009
82a	Ni-Cr	2.24	1.71	.649	.053	.102	.094	2.07	.076	1.07
107a	Ni-Cr-Mo	2.72	1.84	.582	.278	.095		1.35	.103	0.968
115	Ni-Cr-Cu	2.42	1.85	1.01	.113	.032	.031	1.60	.644	15.89
122c	Cast (car-wheel)	3.06	2.34	0.55	.29	.115	.110	0.64	.050	0.024

STEELS (CHEMICAL STANDARDS)

8h	Bessemer	0.116		0.45	0.094	0.050	0.050	0.028	0.054	0.019
10f	Bessemer	.42		.64	.083	.047	.047	.067	.032	.020
170	B. O. H. (Ti-bearing)	.035		.226	.012	.032		.060	.102	.041
15e	B. O. H	.107		.440	.016	.023	.022	.085	.036	.037
11g	B. O. H									
12f	B. O. H	.45		.84	.015	.037	.037	.25	.12	.060
152	B. O. H. (tin-bearing)	.466		.782	.019	.027	.027	.244	.127	.062
13e	B. O. H	.636		.890	.021	.016	.015	.239	.103	.110
14d	B. O. H	.84		.40	.014	.026	.026	.13	.085	.040
16d	B. O. H									
19f	A. O. H	.192		.50	.028	.043	.041	.206	.151	.31
20f	A. O. H									
21d	A. O. H	.651		1.03	.041	.044	.042	.332	.107	.190
34a	A. O. H	.762		0.501	.028	.026	.026	.276	.222	.232
51a	Electric	1.27		.233	.010	.010	.010	.308	.082	.063
65c	Basic electric	0.339		.878	.023	.031	.031	.440	.050	.040
100a	Manganese (SAE T1345)	.447		1.66	.020	.027	.027	.243	.050	.032
105	High-sulfur	.193								
125	High-silicon	.058		0.103	.008	.005	.004	4.97	.066	.047
129a	High-sulfur (SAE X1112)	.097		.806	.094	.272		0.021	.021	.027
130	Lead-bearing	.454		.688	.025	.021	.022	.237	.017	.009
151	Boron		{Boron 0.0027}							
30e	Cr-V steel (SAE 6150)	.505		.79	.026	.036	.036	.270	.094	.027
32d	Cr-Ni steel (SAE 3140)	.396		.795	.012	.027	.027	.301	.096	1.19
33d	Ni-Mo steel (SAE 4820)									
72e	Cr-Mo steel (SAE X4130)	.344		.538	.014	.020	.019	.292	.105	0.241
111b	Ni-Mo steel (SAE 4620)	.193		.706	.012	.015	.013	.302	.028	1.81
36a	Cr 2-Mo 1	.120		.432	.014	.016		.356	.114	0.243
106a	Cr-Mo-Al	.355		.546	.016	.018	.017	.254	.156	.277
135	Cr 5-Mo 0.5	.094		.458	.017	.010	.010	.383	.076	.083
139	Cr-Ni-Mo (NE 8637)	.394		.867	.019	.024	.024	.292	.089	.563
156	Cr-Ni-Mo (NE 9450)	.515		1.40	.032	.017	.017	.226	.053	.475
159	Cr 1-Mo 0.4-Ag 0.1	.521		0.807	.036	.027	.026	.258	.181	.137
50b	W 18-Cr 4-V 1	.728		.325	.029	.007		.294	.110	.089
132a	W 6-Mo 5	.82		.27	.030	.006		.19	.12	.14
134	W 2-Mo 9-Cr 4-V 1	.810		.155	.016	.006		.323	.114	.077
153	W 1.5-Mo 8-Cr 4-V 2-Co 8	.864		.219	.025	.008		.187	.099	.107
155	W 0.5-Cr 0.5	.905		1.24	.015	.010		.322	.083	.100
167	Heat-resisting alloy (S816)									
73b	Cr 14									
133a	Cr 13-Mo 0.3-S 0.3									
101d	Cr 18-Ni 9	.055		0.74	.021	.016		.47	.181	9.05
121b	Cr 18-Ni-10-Ti	.072		1.52	.026	.008		.596	.124	11.14
123a	Cr-Ni-Nb				.035			.46		
123b	Cr-Ni-Nb-Ta				.024			.52		
160a	Cr-Ni-Mo									
166	Cr-Ni	.027								
126a	Ni 36	.056		0.414				.194	.092	35.89
161	Ni 64-Cr 17-Fe 15	.342		1.28	.012	.007		1.56	.045	64.29

Averaged Analyses—Continued

IRONS (CHEMICAL STANDARDS)—Continued

Sample No.	Cr	V	Mo	W	Co	Ti	As	Sn	Al (total)	Al_2O_3	N	Nb	Ta	Pb
4h	0. 117	0. 011	0. 017			0. 024	0. 015				0. 007			
5j	. 021	. 012	. 005			. 044	. 026				. 008			
6f														
7e	. 015	. 045	. 003			. 061	. 088							
55d														
82a	. 323	. 019	. 008			. 065								
107a	. 479	. 028	. 771			. 035								
115	2. 17	. 009	. 002		0. 08	. 021	. 007							
122c	0. 033	. 012	. 003			. 010					. 005			

STEELS (CHEMICAL STANDARDS)—Continued

8h	0. 022	0. 017	0. 003								0. 017			
10f	. 023	. 003	. 010								. 010			
170	. 038	. 003	. 006			0. 231		0. 018	0. 027					
15e	. 030	. 001	. 007								. 010			
11g														
12f	. 074	. 003	. 010											
152	. 050	. 001	. 013					. 036			. 004			
13e	. 128	. 003	. 032											
14d	. 066	. 001	. 007								. 004			
16d														
19f	. 052	. 008	. 058								. 004			
20f														
21d	. 100	. 005	. 035				0. 010	. 077						
34a	. 275	. 007	. 003				. 009							
51a	. 056	. 002	. 002					. 011						
65c	. 025	. 002	. 007					. 008						
100a	. 051	. 003	. 008						. 040					
105														
125	. 017	. 001	. 003			. 006		. 007	. 261					
129a	. 021	. 004	. 007				. 007							
130	. 029		. 003											. 204
151														
30e	. 935	. 150	. 007								. 007			
32d	. 710	. 003	. 038								. 010			
33d														
72e	. 950	. 002	. 215											
111b	. 070	. 003	. 255						. 043					
36a	2. 41	. 006	. 920					. 011						
106a	1. 15	. 002	. 203						1. 08	0. 011				
135	5. 15	. 010	. 575								. 024			
139	0. 549	. 002	. 178											
156	. 429	. 002	. 138						{Silver					
159	1. 00	. 054	. 414						0. 090}					
50b	4. 08	1. 02	. 401	18. 05			. 041	. 025						
132a	4. 21	1. 94	4. 50	6. 20										
134	3. 73	1. 13	8. 68	1. 82										
153	4. 14	2. 04	8. 38	1. 58	8. 45									
155	0. 485	0. 014	0. 039	0. 517										
167														
73b														
133a														
101d	18. 67	. 050	. 110		0. 056			. 009			. 024			
121b	17. 68	. 042	. 075			. 416					. 011			
123a		. 037	. 12	. 11		. 002						0. 75	0. 02	
123b		. 05	. 17	. 18		. 006						. 75	. 20	
160a														
166														
126a	0. 054				. 30		{Iron							
161	16. 88	. 029	. 005		. 47		15. 01}				. 027			

Averaged Analyses—Continued

STEEL-MAKING ALLOYS

Sample No.	Kind	C	Mn	P	S	Si	V	Ti	Al	Ca	Fe	Cr
57	Refined silicon	0.087	0.034	0.008	0.005	96.8	------	0.10	0.67	0.73	0.65	0.025
58	Ferrosilicon (75% Si)	.033	.165	.016	.01	75.6	0.004	.085	.77	.45	22.5	.07
59	Ferrosilicon (50% Si)	.015	.310	.035	.908	50.0	.04	.105	.93	.04	48.4	.08
116a	Ferrotitanium	.023	------	.18	------	3.12	.33	25.12	3.25	------	------	.23

Sample No.	Kind	C	Mn	P	S	Si	Ni	Cr	V	Al	Fe
61a	Ferrovanadium	1.06	1.78	0.119	0.005	5.12	------	0.68	50.19	0.02	------
64a	Ferrochromium	4.41	0.27	.018	.120	2.02	------	66.01	0.154	------	------
66a	Spiegeleisen	4.39	19.77	.049	.021	2.26	------	------	------	------	------
68b	Ferromanganese	6.77	79.97	.293	.006	0.44	------	------	------	------	------
90	Ferrophosphorus	------	------	26.2	------	------	------	------	------	------	------
71	Calcium molybdate	Mo=35.3; Fe=1.92; Ti=0.06.									

BAUXITE AND ALUMINA REFRACTORIES

Sample No.		Total Al_2O_3	Total Fe_2O_3	Loss on ignition	SiO_2	TiO_2	ZrO_2	P_2O_5
69a	Bauxite	55.0	5.82	29.55	6.01	2.78	0.18	0.08
76	Alumina refractory	37.7	2.4	0.22	54.7	2.2	.07	.07
77	Alumina refractory	59.4	0.90	.21	32.4	2.9	.09	.45
78	Alumina refractory	70.0	.79	.26	20.7	3.4	.12	.62

IRON ORES

Sample No.	Name	SiO_2	P	Fe	Mn
27c	Mesabi	2.08	0.028	65.0	------
28a	Norrie	------	------	------	0.435

MANGANESE ORE

Sample No.		Total manganese	Available oxygen	Calculated MnO
25c	------	------	------	------

ZINC ORE

Sample No.	Name	Zn
113	Tri-State concentrate	61.1

PHOSPHATE ROCK

Sample No.	Kind	P_2O_5	Fe_2O_3	Al_2O_3	CaO	MgO	F	SiO_2
56b	Tennessee brown	31.55	------	------	44.06	------	3.4	10.1

Averaged Analyses—Continued

TIN ORES

Sample No.	Kind	Sn
137	Bolivian concentrate	56. 6
138	N. E. I. concentrate	74. 8

CHROME REFRACTORY

Sample No.	Cr_2O_3	SiO_2	FeO	Al_2O_3	CaO	MgO	TiO_2
103	36. 97	8. 24	14. 39	20. 83	0. 79	16. 27	0. 93

FLUORSPAR

Sample No.	CaF_2	CO_2	SiO_2	Zn	Pb	S	Fe_2O_3	Al_2O_3	P_2O_5	TiO_2	K_2O	Na_2O	MgO	BaO	MnO
79	94. 83	0. 99	1. 88	0. 35	0. 23	0. 13	0. 15	0. 02	0. 005	0. 003	0. 01	0. 06	0. 13	0. 07	0. 003

CLAYS

Sample No.	Kind	SiO_2	Al_2O_3	TiO_2	ZrO_2	Fe_2O_3	P_2O_5	V_2O_5	Cr_2O_3	K_2O
97	Flint clay	42. 87	38. 77	2. 38	0. 25	0. 98	0. 08	0. 04	0. 079	0. 54
98	Plastic clay	59. 11	25. 54	1. 43	. 04	2. 05	. 08	. 025	. 021	3. 17

Sample No.	Kind	Li_2O	Na_2O	CaO	MgO	BaO	SO_3	MnO	CuO	MoO_3	Loss on ignition
97	Flint clay	0. 22	------	0. 10	0. 26	0. 015	0. 042	0. 002	0. 003	0. 0002	13. 35
98	Plastic clay	------	. 28	. 21	. 72	. 06	. 07	. 005	. 009	. 0001	7. 28

FELDSPAR

Sample No.	Kind	K_2O	Na_2O	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	TiO_2	Loss on ignition
99	Soda	0. 41	10. 73	68. 66	19. 06	0. 067	0. 36	0. 053	0. 017	0. 52

GLASS SANDS

Sample No.		Fe_2O_3	Al_2O_3	TiO_2	ZrO_2	CaO	MgO
81		0. 073	0. 265	0. 095	0. 031	0. 029	0. 016
165		. 019					

Averaged Analyses—Continued

GLASSES

Sample No.	Kind	SiO_2	PbO	Al_2O_3	Fe_2O_3	ZnO	MnO	TiO_2	ZrO_2	CaO	BaO
89	Lead-barium	65. 35	17. 50	0. 18	0. 049	------	0. 088	0. 01	0. 005	0. 21	1. 40
91	Opal	67. 53	0. 097	6. 01	. 081	0. 08	. 008	. 019	. 01	10. 48	------
92	Low-boron	------	------	------	------	------	------	------	------	------	------
93	High-boron	80. 60	------	1. 94	. 076	------	------	. 027	. 013	(1)	------
80	Soda-lime	74. 1	------	. 33	. 065	------	. 003	. 02	. 003	4. 65	------

Sample No.	Kind	MgO	K_2O	Na_2O	B_2O_3	P_2O_5	As_2O_5	As_2O_3	SO_3	Cl	F	Loss on ignition
89	Lead-barium	0. 03	8. 40	5. 70	------	0. 23	0. 36	0. 03	0. 03	0. 05	------	0. 32
91	Opal	. 008	3. 25	8. 48	------	. 022	. 102	. 091	------	. 014	5. 72	------
92	Low-boron	------	------	------	0. 70	------	------	------	------	------	------	------
93	High-boron	0. 026	0. 16	4. 16	12. 76	(1)	. 14	. 085	. 009	. 036	------	------
80	Soda-lime	3. 23	. 04	16. 65	------	------	. 07	. 03	. 41	. 047	------	. 30

[1] Not detected.

LIMESTONE, DOLOMITE, SILICA BRICK, BURNED MAGNESITE, AND TITANIUM DIOXIDE

Sample No.	Kind	SiO_2	Fe_2O_3	Al_2O_3	TiO_2	MnO	CaO	SrO	MgO	Na_2O
1a	Limestone	14. 11	1. 63	4. 16	0. 16	0. 038	41. 32	0. 12	2. 19	0. 39
88	Dolomite	0. 31	0. 084	0. 067	. 005	. 006	30. 49	<. 01	21. 48	. 08
102	Silica brick [1]	93. 94	. 66	1. 96	. 16	. 005	2. 29	------	0. 21	------
104	Burned magnesite	2. 54	7. 07	0. 84	. 03	. 43	3. 35	------	85. 67	. 04
154	Titanium dioxide	------	------	------	98. 7	------	------	------	------	------

Sample No.	Kind	K_2O	SO_3	S	P_2O_5	CO_2	C	H_2	Loss on ignition
1a	Limestone	0. 71	0. 04	0. 25	0. 15	33. 53	0. 61	------	34. 55
88	Dolomite	. 03	. 035	. 013	. 003	47. 25	. 08	0. 008	47. 52
102	Silica brick	. 29	------	------	. 025	------	------	------	0. 38
104	Burned magnesite	<. 01	------	------	. 057	------	------	------	------

[1] Density 2.33 g/cm³ at 25° C.

SILICON CARBIDE

Sample No.		Total Si	Total C	Free C	SiC	Fe	Al	Ti	Zr	Ca	Mg
112	------	69. 11	29. 10	0. 09	96. 85	0. 45	0. 23	0. 025	0. 027	0. 03	0. 02

4.2. Chemicals

Sample No.	Name	Purity on basis of titration	Heat of combustion
84d	Acid potassium phthalate	100. 04	
39g	Benzoic acid	99. 99	26.4338 absolute kilojoules per gram mass (wt in vacuum).
40f	Sodium oxalate	99. 96	
83b	Arsenic trioxide	99. 99	
136a	Potassium dichromate	99. 99	

SUGARS

Sample No.	Kind	Moisture	Reducing substances	Ash
17	Sucrose	<0. 003	<0. 002	<0. 003
41	Dextrose	<. 01		<. 003

5. General Information

5.1. Literature

Detailed certificates of analyses are sent under separate cover to the same destination as the samples. In the case of new or renewed samples provisional mimeographed certificates will be supplied until the printed certificates are available.

5.2. Samples Out of Stock

The preparation of "renewal" samples is intended to be completed at the time each kind of sample becomes exhausted, but owing to delays encountered in obtaining a proper grade of material and for other reasons, this is not always possible. If orders are received for samples that are out of stock, notice will be mailed to that effect. The "renewal" of an analyzed sample will have a composition more or less different from that of its predecessor, but, as regards the characteristic constituent or constituents, will pattern after it closely.

5.3. New Samples

When new samples or renewals of old ones are issued, announcement will be made in the Federal Register and in scientific and trade journals.

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